DIGESTION IN PLANTS.—Dr. Lawson Tait has recently investigated afresh the Digestive Principle of Plants. While he has obtained complete proof of a digestive process in *Cephalotus*, *Nepenthes*, *Dionæa*, and the *Droseraceæ*, he entirely failed with *Sarracenia* and *Darlingtonia*. The fluid separated from *Drosera binata* he found to contain two substances, to which he gives the names "droserin" and "azerin." Dr. Tait confirms Sir J. D. Hooker's statement that the fluid removed from the living pitcher of *Nepenthes* into a glass vessel does not digest. A series of experiments led him to the conclusion that the acid must resemble lactic acid, at least in its properties. The glands in the pitchers of *Nepenthes* he states to be quite analogous to the peptic follicles of the human stomach; and when the process of digestion is conducted with albumen, the products are exactly the same as when pepsine is engaged. The results give the same reactions with reagents, especially the characteristic violet with oxide of copper and potash, and there can be no doubt that they are peptones.

STIPULES IN ONAGRACIÆ.—Prof. Baillon says (*Bull. mensuel. Soc. Lin. de Paris*, No. 33) that in the majority of works on descriptive botany, this family is mentioned as characterised by the constant absence of stipules, and in justification of this quotes the classical works of Decaisne, Duchartre, Endlicher, and Hooker; nevertheless he states that the existence of these organs in this family admits of easy proof, not indeed that they ever occur of large dimensions, for then they could not have escaped detection, but still they are present, more commonly as little subulate tongue-like bodies, acute, often red-coloured at the base of the petioles in both opposite and alternate-leaved plants. In Hauya they soon turn black and wither off early. In the fuchsia of our gardens little stipules are often present. In Circea they can also be detected. In the Lopezia of our gardens all the leaves have two very distinct stipules, which indeed have been often referred to in botanical works, and it is the same with Haloragia, though Bentham and Hooker describe them as here absent.

A NEW GREEN CILIATED PLANT.—Under the title of "A New Ciliated Organism furnished with Chlorophyll," Prof. van Tieghem has published (*Bull. Soc. Bot. France*, 1880, p. 130) a memoir of a strange new form. The organism in question was found by Prof. Perrier twice: once at Roscoff, in sea-water containing algæ and some of the lower animals; and again at the Museum (Paris), in a little aquarium in the laboratory. It presents the appearance of a gelatinous tremulous mass of a pure green colour; in outline well defined, spherical or oval in shape, attaining more than a centimetre in diameter, and attached by a portion of its periphery to a large marine alga. At first sight it would be called a Nostoc. Exposed to sunlight it gave out oxygen, so one concludes its colouring-matter to be chlorophyll. On a closer inspection it is seen that the mass is composed of a colourless jelly, scattered throughout which are isolated green points, visible to the unassisted eye, and sufficiently numerous as to give to the whole mass the green coloration distinguishing it, so one would not now refer it to Nostoc. Each little green body is spherical, and measures from three to four-tenths of a millimetre. It is formed of a very finely granular and somewhat dark protoplasm, very uniformly permeated with an amorphous chlorophyll; neither nuclei nor vacuoles, nor red spot were detected, and the surrounding membrane was very thin. At one place (called the pole) the cell bore a tuft of vibratile cilia which were attached side by side, so as to cover a space more or less large according to age and to allow of independent movements. On the equator at two diametrically opposite points a small hollow in the green mass is seen, and by these passes a band of homogeneous protoplasm which traverses the membrane, turning towards the pole, and in the superior hemisphere dividing on its outer border into fine fringes with vibratile cilia. These cilia are confluent at their base, and are not independent in their movements. In process of development the polar cilia become detached (absolutely fall off), next the lateral moustaches disappear (these seem to be retracted), a continuous membrane covers over all, but the general aspect and dimensions remain unchanged. Later on the cell divides into two (equatorially), next it divides again (perpendicularly), and the segmentation continues until there is a family of sixteen rounded-off cells, and the organism has passed through a phase of encystment. Lastly each daughter cell increases in size, separates more and more from its neighbour, gets closed in a fine membrane, and then appears all covered over with cilia. It now escapes into the water and secretes in abundance a gelatinous material. The clothing of cilia drops off as the form approaches its adult size: soon appear the polar cilia, next the lateral moustaches; and so far its life-history is complete. At no phase in its development was either cellulose detected in its cell-membrane, nor starch in its protoplasm. Prof. van Tieghem concludes:—"Is this organism an animal or a plant? I am not well able to say, and I must add besides that this question, to which formerly so much importance attached, in the actual condition of science, appears to me to be destitute of interest." It is called *Dimystax perrieri*. With every respect to the dictum of so distinguished a botanist as Prof. Tieghem, we venture to call our readers' attention to this strange form, which M. Roze seems disposed to regard as an animal, in the hopes that some of them may assist in determining its proper position in nature.

PHYSICAL NOTES

A FRESH measurement has been made by Mr. T. C. Mendenhall of the acceleration of gravity at Tokio, an account of which appears in the *American Journal of Science*. The experiments were made after the accepted methods with Kater's and Borda's pendulums, the only novelty introduced being that of employing a chronograph in connection with a reliable chronometer to determine the time of vibration of the pendulum. At every sixtieth or hundredth vibration of the pendulum a light break-circuit apparatus placed beneath it was raised to just such a height as to be "thrown" by the pendulum at its lowest point of swing, thus enabling its rate to be calculated to the ten-thousandth of a second. Mr. Mendenhall considers his determinations to be more reliable than those of Professors Ayrton and Perry, which were made with a long wire pendulum; he revises their calculations, altering their value of "g" from 9·7974 to 9·7979, and asserts that their calculation of the theoretical value by Clairaut's formula is wrong, and should be 9·7980, not 9·797 (metres). His own determinations give a mean result of 9·7984.

A SECONDARY battery, the electrodes of which consist of porous fragments of gas-carbon, has been devised by M. Henri Sauvage. Though inferior in power and durability to a perfectly "formed" Planté cell with lead electrodes, this cell would be cheaper, more readily and rapidly constructed, and would yield a current of longer duration. The action is probably due to the occlusion of the hydrogen and oxygen gases respectively in the pores of the carbon. The inventor recommends that the two plates used as electrodes be kept apart with a simple thin wooden frame.

PROF. O. N. ROOD calls attention to the fact that when the colour of ultramarine blue is mixed with white by the method of rotating disks the tint appears to verge towards violet. Brücke advanced the explanation that what we call white is really a reddish colour. Aubert, on the contrary, regarded it as showing that violet is only a pale shade of ultramarine blue. A series of experiments made with other colours showed that when mixed thus with white green-yellow becomes greenish, and green green-bluish, that full yellow and orange incline to red, and red becomes purplish. These observations accord with neither theory, and Prof. Rood advances none himself. He thinks that the fact as it stands explains why it is impossible in the polariscope to produce a red free from purplish tint, there always being white light mingled with the red rays.

PROF. J. TROWBRIDGE, in investigating with telephones connected to earth-plates the flow of return-currents through "earth," found that at a mile from the Harvard College Observatory the time-signals of the observatory clock could be heard by merely tapping the earth at points fifty feet apart.

FROM his recent researches on dilatation and compressibility of gases under strong pressures, M. Amagat derives (*Comptes rendus*, August 30) the following laws:—1. The coefficient of dilatation of gases (for temperatures not too much above the critical) increases with the pressure to a maximum, then decreasing indefinitely. 2. This maximum occurs under the pressure with which the product $p\,v$ is minimum, where the gas accidentally follows Mariotte's law. 3. It diminishes for higher and higher temperatures, and at length disappears. 4. At a sufficiently high temperature the compressibility of fluids is represented by the formula $p\,(v - \alpha) = \text{const.}$; α being the smallest volume the mass of fluid can occupy; this is the limiting law. For each gas α has a special value. 5. For pressures

below the critical the deviation (from Mariotte's law), first positive for a temperature sufficiently low, becomes *nil*, then negative, with increasing temperature; but beyond a certain negative value it diminishes indefinitely without changing sign. 6. For pressures between the critical pressures and a superior limit, special for each gas, the period during which the deviation is positive is preceded at a lower temperature by a period in which it is negative; so that the deviation twice changes sign. 7. Beyond the upper limit of pressure indicated in the preceding law the deviation is always negative, whatever the temperature; it diminishes, in general, when the temperature increases, except for pressures near the limit, where its variation is more complicated.

IT is known that rain and other meteoric waters contain a quantity of gas and saline matters which they find in the atmosphere and carry with them. The amount varies with the seasons, but may be estimated, on an average, at about 8 cc. of oxygen, and 0·50 to 0·60 cc. carbonic anhydride per litre, along with small quantities of ammonia, nitrite, nitrate, and carbonate of ammonium, organic matters, and chloride of sodium. In a recent paper to the Belgian Academy M. de Koninck holds that in the alteration and metamorphism of rocks by infiltration of those waters may be found the solutions of many questions in geology hitherto unsolved. The facts he cites relate to tertiary and quaternary deposits which in many parts of Belgium are so transformed by the waters in question that it is impossible to recognise them if account be taken only of petrographic characters.

FROM observing how different persons gave different estimates of the apparent size of blood-corpuscles seen in the microscope, M. Montigny was led to make a series of further experiments on the subject (which are described in the *Bulletin* of the Belgian Academy, No. 6). He comes to the conclusion that even for good observers an estimation of the kind referred to is principally affected by the length of distinct vision, but that often this appreciation is subject to the influence of occult causes which affect the relation between sensation and judgment. The examination of microscopic objects may be influenced, like astronomical observations, by a kind of *personal error*, by reason of which individuals have a tendency to see microscopic images, some larger, others smaller, than they should appear, abstraction being made of the influence of the length of distinct vision on our appreciations. These conclusions, it is pointed out, do not at all affect the exactness of measurements determined by *savants* with the microscope, but they tend to show that each observer should measure for himself the different magnifying powers of the instrument he uses, obtained by changes of eye-pieces and objectives.

WITH the view of demonstrating the mechanical action of electrolysis, all action of heat being excluded, Signor Basso has lately experimented thus (*Il Nuovo Cim.*, ser. 3, tom. vii.). A thin square glass plate is covered with collodion, and on this when dry is put a thin layer of good gelatine, mixed with about $\frac{1}{20}$ of its weight of a saturated solution of bichromate of potash. The bare side of the plate is exposed to light, to attach the gelatine layer. Then the plate is put in an aqueous solution of chloride of gold till the upper layer is impregnated with the gold salt, and it is exposed to diffused daylight. Next the covered side is strewed with fine graphite, and the glass connected by means of four fine wires running along its sides to the negative pole of a battery. The plate is then placed in an ordinary bath of sulphate of copper. The copper is deposited regularly on the whole of it. In a few days wrinkles and bubbles appear; and if the copper have been deposited as far as the borders, the plate may at length even break, thus proving the mechanical force, which is a direct consequence of electrostriction.

ON THE PRESENT STATE OF SPECTRUM ANALYSIS[1]

AT the Sheffield meeting of the British Association a committee was appointed to report on the present state of spectrum analysis. The committee has this year presented its first report. The report is divided into four parts:—

1. On the spectra of metalloids, drawn up by Dr. A. Schuster.
2. On the influence of temperature and pressure on the spectra of gases, drawn up by Dr. A. Schuster.
3. On the emission spectra of the rays of high refrangibility, drawn up by Prof. W. N. Hartley.
4. On the absorption spectra of the rays of high refrangibility, drawn up by Prof. A. K. Huntington.

In the report on the spectra of metalloids, we have for each element a full account of the literature on the subject with all necessary references. The various spectra of each metalloid and its compounds are enumerated, and special stress is laid on the discussion which nearly always has taken place on the chemical origin of these spectra. It will be found that often more work is needed to clear up doubtful points, but there is no special controversy at issue at the present moment except in the case of the carbon spectra. A discussion of very long standing is still occupying the minds of many spectroscopists as to whether the spectrum which is seen at the base of every candle flame is due to carbon or to a hydrocarbon. The arguments and experiments on either side are given in detail and are finally summed up as follows:—"Those who believe the spectrum to be due to the element carbon rely chiefly on the brilliancy with which these bands are developed when cyanogen is burnt in oxygen, also when the spark is taken in cyanogen, carbon tetrachloride, and carbonic oxide at high pressure; all the gases being dried with the greatest care. Those who oppose this view and who hold that the spectrum is due to a hydrocarbon refer to the impossibility of excluding all traces of moisture, and to the fact that this spectrum is well developed under circumstances where we know hydrocarbons to be present."

When cyanogen is burnt a series of bands appears in the blue violet and ultra-violet, and another controversy has taken place whether these bands are due to carbon or to a compound of carbon and nitrogen. Two papers have lately appeared on the subject. One by Mr. Lockyer, in which he describes an experiment in which the bands were seen in a spark taken in carbon tetrachloride, although the nitrogen lines were not visible in the jar discharge; and another by Professors Liveing and Dewar, in which these bands were traced to impurities of nitrogen in all cases in which they were seen. A spark in carbonic oxide showed the bands when the gas was prepared from ferrocyanide of potassium, but not when it was made by heating a mixture of quicklime with pure and dry potassium oxalate. When all the air had been properly expelled a tube containing carbon tetrachloride did not show the bands.

The following quotation will give an idea of the points which are discussed in the second report:—

"We shall endeavour for clearness' sake to arrange our material under five different heads. We shall first discuss what changes we have a right to expect in the appearance of a spectrum, if the quantity of luminous matter is increased or if the temperature is raised, the absorbing properties of the gas remaining unaltered. We shall next speak of the widening of lines, which, as we shall see, often accompanies an increase of pressure. Then we shall treat of the different spectra given by one and the same body at different temperatures; and we shall see how far satisfactory explanations have been offered for their existence.

"So far our road will be clear; but we shall see that these spectra of different orders, as they have been called, are only extreme cases of continuous changes which are nearly always going on. Very often we can refer these continuous changes to a gradual displacement of one spectrum by another; but often we shall not be able to prove the existence of a second spectrum. There is *à priori* nothing impossible or even improbable in the view that the relative intensity of different lines may be different at different temperatures, and often when we observe a variation we may equally well explain it by assuming the gradual appearance of a new spectrum or an alteration only in the relative intensities of the lines. It becomes then a matter of extreme difficulty to decide which of the two suppositions is correct. In doubtful cases we may often be able to obtain important information by means of a method which is little understood even by spectroscopists. It is the method which has first been extensively used and investigated by Mr. Lockyer of projecting an image of the luminous source, spark, arc, or flame on the slit of the spectroscope and thus localising the spectra, which are thrown and confused together if the luminous source is examined directly without the interposition of a lens. We shall see how by means of this method we shall often at a single glance be able to tell how the body will behave at different temperatures and under different pressures. Many facts which have been quoted as remarkable might have been foretold by means of this method. Our fourth chapter will be devoted to it. In our last chapter we

[1] Abstract of Report read at the Swansea meeting of the British Association.